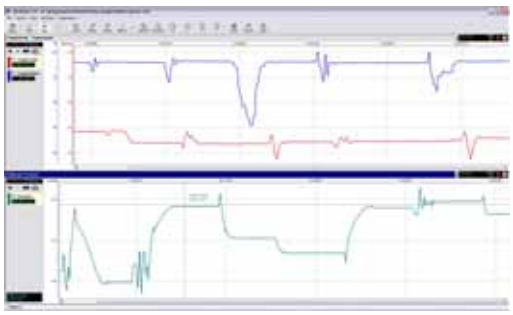
HDM97*Pocket* Reference Meter Series



User Manual

HDM97*BN*
HDM97*BO*
HDM97*BP*

Preface

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This manual is only valid for the software revisions listed below:

HDM97*BP*	**V 1.00 ...1.09**
HDM97*BO*	**V 1.00 ...1.09**
HDM97*BN*	**V 1.00 ...1.09**
IBPView	**V 2.00**

CE 0482

SAFETY INSTRUCTIONS

For your and your patients safety read and consider the safety instructions below carefully

- **Read the entire manual carefully before using the HDM97*Pocket* .**
- **Keep the instrument away from unauthorised persons.**
- **Only use the** HDM97***Pocket*** **as reference instrument to measure Conductivity, Temperature, Pressure and pH depending to it's equipped features.**
- **Never use the HDM97*Pocket* as a replacement of sensors of a medical device.**
- **Do not use the HDM97*Pocket* in conjunction with a medical device during a treatment.**
- **Only use the instrument in a dry environment and do not touch it with wet hands.**
- **Make sure that no liquids intrude inside the instrument or it's inlets / outlets.**
- **Always use a clean protection filter for the pressure transducer inlet.**
- **Prevent every mechanical overstraining of electrical wires. Never buckle or pull the cable of the conductivity probe.**
- **If the acquired values seem to be not believable, make sure that the** HDM97***Pocket*** **is not defective**
- **Prevent electrostatic discharge on the connectors. This can lead to substantial damage of the instrument. Make sure to be completely discharged before touching the connectors or cables connected to the instrument.**
- **Adjust the meter only, if you are familiar with the consequences of the adjustment. Consider the hints for reference solutions in the user manual.**
- **Potentials above 42V against earth ground are dangerous. This potentials can lead to electrical shock and therefore to health hazards. Make sure that none of the connectors has higher voltage than mentioned before.**
- **The direct connection of earth potential to any connector of the instrument is not applicable for safety purposes and may substantially damage the instrument. Make sure that the medical device itself is properly connected to earth ground according to its instruction manual.**
- **Make sure that the instrument never heats over 60°C / 140°F. Prevent direct sunlight.**
- **Never sterilize the instrument using an autoclave. Danger of explosion of the battery!**
- **Never throw the meter into a fire. Danger of explosion of the battery!**
- **Never open the meter. There are no parts inside you can repair.**
- **Never try to replace or repair the internal battery. Handled in the wrong way these part is dangerous. Extreme risk of fire and explosion!**

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Introduction

The HDM97***Pocket*** meter series are reference instrument designed for the calibration of medical devices such as hemodialysis machines. Please read this entire manual carefully before the first use of the instrument.

Application

Depending on the version the HDM97***Pocket*** may be equipped with up to 4 acquisition channels:

Channel	**HDM97*BN***	**HDM97*BO***	**HDM97*BP***
Conductivity	✓	✓	✓
Temperature	✓	✓	✓
Pressure		✓	✓
pH			✓

The instrument was designed to be used as a dialysis machine maintenance instrument, but can also be used as laboratory measuring instrument as well as instrument for environmental purposes.

This instrument displays measuring values numeric. Graphical displays are available through a PC or Notebook using the optional Software *IBPView*.

Using the USB communication interface it is possible to obtain measuring values regardless of the instrument display's content. These values can be displayed in any way or stored for further processing.

EC DECLARATION OF CONFORMITY

according to the Council Directive 93/42/EEC concerning medical devices

Manufacturer	IBP Medical GmbH Ikarusallee 15 30179 Hannover
	declare under our sole responsibility that the following products:
	HDM97Pocket Reference Meter Series
	Version HDM97BN ***HDM97BO*** ***HDM97BP***
	Product Code: 31.010X.0X
	X = Depending on Version
	meet the provisions of the Council Directive 93/42/EEC concerning medical devices which apply to them.
Product Classification	II B
Notified Body	Medcert GmbH Vorsetzen 35 20459 Hamburg
Identification Number	0482

Hannover 27.05.08

Responsible:
Dipl. Ing. Werner Pfingstmann

Delivery Content

Pos.	Description	Standard	Option
1	HDM97*Pocket* meter	✓	
2	Conductivity/Temperature Probe	✓	
3	Dialyser Line Adapter	✓	
4	Hose for pressure measurement	✓	
5	14,00 mS/cm Conductivity Reference Solution	✓	
6	Battery charger with wall plug adapters	✓	
7	USB interface cable	✓	
8	CD - HDM97*Pocket* with USB drivers, Software and User Manual	✓	
9	Safety instructions and quick start guide	✓	
10	pH Probe with solution pH6, 7 and 8		✓
11	Carrying case		✓
12	CD - IBPView Data Acquisition Software		✓

Warranty

IBP Medical GmbH warrants that it will repair or replace, at its option, any defective or malfunctioning part without charge for the terms listed below. Parts used for repair or replacement are warranted for the remaining warranty period only.

The user must deliver, at its own expense, the product to IBP Medical GmbH.

Parts	**Warranty – Period***
HDM97***Pocket***	24 Month
Conductivity/Temperature-Probe	24 Month

* from date of delivery note

The warranty does not cover:

- Disposable parts as battery or pH electrode
- Annually calibration
- Cell cleaning
- Defects caused by:
  1. Modification, alteration, repair or service of the product by anyone other than IBP Medical or an authorized service center
  2. Misuse due to negligence or accident
  3. Operation or maintenance of the product in a manner contrary to IBP instructions

Any express warranty not provided herein, and any remedy for breach of contract that but for this provision might arise by implication or operation of law, is hereby excluded and disclaimed. The implied warranties of merchantability and of fitness for any particular purpose are expressly limited to the terms mentioned above. Some states do not allow limitations on the duration of an implied warranty, so the above limitation may not apply to you.

Under no circumstances shall IBP Medical GmbH be liable to the original purchaser or to any other person for any special or consequential damages, whether arising out of breach of warranty, breach of contract, or otherwise. Some states do not allow the exclusion or limitation of special or consequential damages, so the above exclusion or limitation may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

For further warranty information, contact IBP Medical GmbH.

Product Overview

pH **Pressure** **Conductivity and Temperature (cable is attached)**

Measuring Channels

Only use accessories provided with the HDM97***Pocket***. Use of other devices may damage the instrument and will void the warranty.

Conductivity/Temperature Probe

The Conductivity/Temperature Transducer is a quadropole design for greater accuracy and longevity than other designs.

Pressure transducer

To avoid damage or inaccurate measurement, ensure that no fluids enter the instrument. We recommend the use of a Transducer Protector for this purpose.

pH

The input connector is designed exclusively for pH electrodes. It is optimized for glass electrode single-rod measuring cells with a slope of ΔE of 59mV at 20°C. Its absolute maximum allowable input voltage span extends from -3 Volts to +3 Volts with respect to BNC Shield. Applying any voltage beyond these boundaries will possibly destroy the instrument.

Precautions using the pH Probe input

Due to the high sensitivity of the pH input it can not be fully protected against electrostatic discharge. It can only be protected by plugging the protective cap to its BNC receptacle. Always attach the protective cap, if the pH input is not used. Do not leave the input open, otherwise the circuit inside may be damaged. The minimum input impedance of the input is 10 Tera Ohms ($10*10^{12}$ Ohms). The leakage current is typ. 2 femto Amperes ($2*10^{-15}$) Amperes.

Charging the battery

The HDM97***Pocket*** is internally equipped with a high performance Lithium-Ion-Polymer battery. It can be charged using the external power supply, a PC or a laptop which is connected via the USB cable to the instrument. The battery of the HDM97***Pocket*** can only be charged from USB ports which are capable of delivering 500 mA of current.

This is appropriate to most connectors of laptops or PC's. Connecting the meter to a passive (e.g. not externally powered) USB hub, the battery can not be charged and the communication may not work well. During the charging process the battery symbol in the display is animated.

Performing measurements while the battery is being charged

The HDM97***Pocket*** can be used for measuring while the battery is being charged. To maintain the dialysis machine and the patient's safety the USB part is isolated to the appliance part of the meter withstanding a voltage of 4000 Volts AC or 6000 Volts DC for at least one minute according to EN60601-1. The appliance part consists of the conductivity, temperature, pressure and pH channel and its connectors, depending on the version.

ATTENTION: The USB connector is not part of the appliance part.

Flow-through adapter for conductivity and temperature measurement

The adapter is suitable for measuring pressure, temperature and conductivity in flow-though mode. With immersion usage of the probe it is suitable for measuring temperature and conductivity concurrently. The preferred orientation of the adapter is vertical. The axial connector must point down (see picture). In flow-through mode the axial connector is to be used as inlet meanwhile the side connector is to be used as outlet. The connection to the pressure transducer inside the HDM97***Pocket*** is accomplished by the lateral connection above the inlet. Before measurement it is necessary to shake the adapter slightly, so that air bubbles trapped inside can pass off through the outlet.

For immersion usage the probe must be unscrewed from the flow-through adapter. To accomplish that do not turn the upper shank, the probe may be damaged. Only turn the nut as shown in the picture left.

Never touch the electrode surfaces with your fingers or other objects.

Do not buckle the cable of the probe. The minimum allowed bending radius is 3 cm e.g. 1¼ inches.

Keypad

Main functions

The keypads main functions of the HDM97*Pocket* are listed below:

Key for switching the instrument on and off

Key for selecting the channel CD/TP ; TP ; PRESSURE ; pH

Key for selecting the unit to display.

Key leads to channel dependent special functions

Key to tare the pressure transducer

The keypad layout is shown in the left picture.

The keys , and have different sub functions depending on the channel currently displayed. These sub functions are explained in chapter "Measuring"

Additional functions

The yellow keys below the display can be used to set values and navigate through menu options or setting. These functions become available when the symbols shown in the right picture appear at the bottom of the display.

ESC Cancels the current setting or selection and returns to measuring mode.

Decreases a value or selects the previous option in a menu or a setting.

Increases a value or selects the next option in a menu or a setting.

OK Applies a value or a selects an option in a menu or a setting.

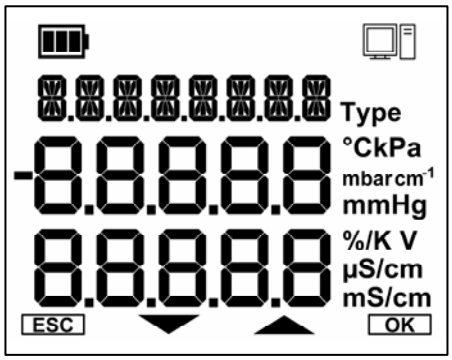
Switching on the instrument

The instrument is switched on and off by pressing the key.

Display test during start up

Immediately after switching on the instrument the display shows all possible segments dark for two seconds. Compare the display with the picture on the right side. Do not use the instrument further if you discover any missing segment, because wrong values could be displayed which may lead to misreading.

The content of the display must be shown exactly like this picture right from this text.



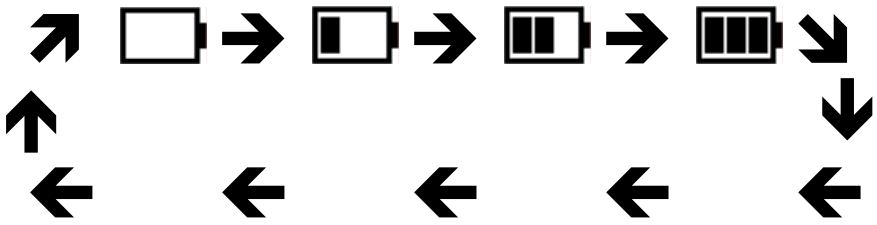
Power saving function

The HDM97*Pocket* switches off automatically if the battery is empty. If enabled, it also switches off after a specified time if one of the conditions listed below becomes true for the specified time period.

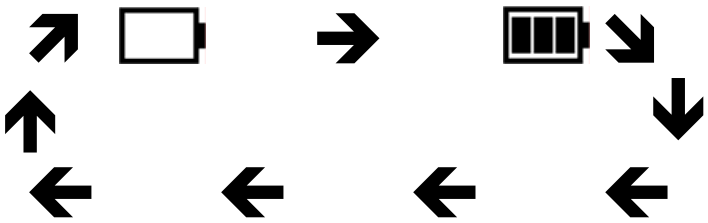
- In pressure mode: The value remains 0 for the specified time period
- In conductivity mode: The conductivity is 0 µs/cm for the specified time period
- In pH mode: The pH probe is not connected for the specified time period

Displaying battery charge progress and finish

If the battery is being charged the symbol at the left top corner in the display is animated in 4 steps. There is a delay of one second displaying each step. After the last step has been displayed the animation starts from again like illustrated in the picture below.



After the battery has been charged up to its maximum capacity, the inner 3 columns of the battery symbol start to blink in a one second period as shown is the illustration below.



Battery gauge display during operation

If nothing is connected to the USB port during operation the internal battery is used to supply power to the instrument. The battery symbol in the left top corner of the display shows the remaining capacity of the internal battery. The combinations have the meanings listed below:

The battery is 100% full.

The battery has approx. 2/3 of its capacity left.

The battery has approx. 1/3 of its capacity left.

The battery is empty, approx 10% is left.

If this symbol starts flashing the battery is totally empty and the meter will switch off shortly.

Battery aging

The battery technology of the HDM97***Pocket*** is based on Lithium-Ion-Polymer technology. This technology has many advantages compared with Nickel-Metal-Hydride technology which are lower weight, smaller size, longer life, no memory effect and higher efficiency. However, after a couple of years (5 years estimated) the battery's capacity will start decreasing.

Battery replacement – ONLY BY MANUFACTURER

Do not try to replace the battery by yourself. The battery is mounted directly onto the main PCB inside the HDM97***Pocket***, and the main PCB itself contains the battery protection circuit. If the battery is not handled in the right way, there is extremely danger of fire and explosion. Therefore, this battery can only be replaced from IBP personnel who have run through a special training in handling Lithium-Ion batteries.

Basic settings

To invoke the installation menu please follow the steps below:

1. Switch off the meter using the ⏻ key.

2. Switch it on again using the same ⏻ key.

3. Immediately press the F key once during the display test.

4. After this procedure the instruments starts the basic settings dialog instead of entering any measurement functions.

5. In the basic settings dialog the user is able to adjust a variety of settings.
   These are:

Parameter	**Description**
AUTO-OFF	Selects the auto power off delay time or disables this feature.
LANGUAGE	Selects the display language
CAL-RES	Replaces the user calibration dataset with the factory calibration dataset
PH	Enables or disables the pH channel "PH"
TEMP	Enables or disables the single temperature channel "TEMP"
BEEP	Enables or disables the keypad acknowledge beep

▼ → **AUTO-OFF**

OK → ▲ OFF → disables function
→ ▲ 30 MIN → 30 minutes delay
→ ▲ 60 MIN → 60 minutes delay
→ ▲ 90 MIN → 90 minutes delay

Then OK to apply this setting,
or ESC to discard this setting.

▼ → **LANGUAGE**

OK → ▲ DEUTSCH → German language
→ ▲ ENGLISH → English language

Then OK to apply this setting,
or ESC to discard this setting.

▼ → **CAL-RES**

OK → Press 5 seconds until the counter in the display reaches zero. Then a calibration dataset reset will be performed. This takes a couple of seconds. The instrument performs a restart afterwards.

▼ → **PH (or TEMP)**

OK → ▲ ON → pH channel (or temp-channel) enabled

→ ▲ OFF → pH channel (or temp- channel) disabled

Then OK to apply this setting,
or ESC to discard this setting.

▼ → **BEEP**

OK → ▲ ON → keypad beep enabled

→ ▲ OFF → keypad beep disabled

Then OK to apply this setting,
or ESC to discard this setting.

Value adjustment

The adjustment of values is done via the navigation keys ▲ and ▼. By pressing and holding down one of these keys the last (right) digit of the value will be incremented or decremented depending on the key. If this digit reaches the boundary it remains 0 and the next digit will begin to change. If the key is being released and pressed again the procedure will start again beginning with the last digit.

Example showing a value, which has an allowable range from 0.00 to 7.50:
Display: 0.00 ; navigationkey ▲ is hold down:

Order of value incements (every change follows with a delay of 0.3 seconds):

0.0**1**→0.0**2**→0.0**3**→0.0**4**→0.0**5**→0.0**6**→0.0**7**→0.0**8**→0.0**9**	(carry-over)
0.**1**0→0.**2**0→0.**3**0→0.**4**0→0.**5**0→0.**6**0→0.**7**0→0.**8**0→0.**9**0	(carry-over)
1.00→**2**.00→**3**.00→**4**.00→**5**.00→**6**.00→**7**.00→7.**5**0	(Max value reached)

If the value will exceed the range limits (in this case from 7.00 to 8.00) the value will be truncated to the maximum allowed value, 7.50 in this particular example. The Symbol ▲ will become blank and the meter does not react on the corresponding navigation key. The values can only be changed down to 0.00 using the other ▼ key.

Measuring

By pressing the key the user can select between all available channels of the HDM97***Pocket***.
These channels are

- Conductivity and temperature Display "CD/TEMP"
- Temperature Display "TEMP" (if enabled)
- Pressure Display "PRES" (only HDM97*BP* and HDM97*BO*
- pH Display "PH" (only HDM97*BP*, if enabled)

Conductivity and temperature measurement

In this mode the display shows "CD/TEMP" in the upper line, the temperature value in the middle line and the conductivity value in the bottom line.

By pressing the key

the user can choose the temperature coefficient.

Temperature Coefficients

This is a topic that is frequently misunderstood and often neglected in hemodialysis.
A solution's conductivity will change according to temperature. With increasing temperatures, the measured solution's conductivity will increase, too. To achieve meaningful measurement results, the conductivity value displayed is compensated to 25°C. In other words, the display is always converted to a solution temperature of 25°C. The temperature coefficient which the displayed value is compensated with is expressed as %/°C. Unfortunately however, different solutions also have different temperature coefficients. To achieve an exact display, the instrument will have to be adjusted to the temperature coefficient of the current solution. The average temperature coefficient for dialysates is 2.07 %/°C.

Listed below are the temperature coefficients used by most major hemodialysis machine manufacturers. We recommend that you double check this data with documentation from your machine's manufacturer

Display	Machine Manufacturer	Temperature Coefficient
BAXTER	Baxter (Europe Machines)	2,20 %/K
BELLCO	Bellco	2,10 %/K
B.BRAUN	B.Braun	2,10 %/K
FRESENI	Fresenius	2,10 %/K
GAMBRO	Gambro (AK-Type Machines)	2,07 %/K
GAMBRO	Gambro Phoenix	2,07 %/K
HOSPAL	Hospal	2,07 %/K
	Nikkiso	
NIK BIC	Bicarbonate Conductivity	2,20 %/K
NIK ALL	Gesamt- Conductivity	2,05 %/K
STANDARD		2,07 %/K
USER TC		(Your choice)

For naturally occurring solutions, a value of 1.97 %/°C is frequently used. Many measuring devices not specially tailored to dialysis will use this value.
The calculation below shows the drastic effects of an incorrect temperature coefficient.

Example calculation for an incorrect temperature coefficient, using a dialysate with a temperature coefficient of 2.07 %/°C:

Conductivity of solution mS/cm	Temperature of solution °C	Temperature coefficient of meter %/K	Meter display mS/cm	Difference in values %
14,00	37,0	2,07	14,00	0,00
14,00	37,0	1,97	14,17	1,21

Which temperature coefficient you should use

First of all please double-check the Temperature coefficient with the machine manual.
If you have machines from one manufacturer only in your use the temperature coefficient that the dialysis machine uses for compensation.
If you have different types of dialysis machines in your unit the best solution is to use a temperature coefficient of 2.07 %/°C for **all** machines. This avoids confusion with different readings of the conductivity on different machines.

Selecting the temperature coefficient

Be aware that changing the temperature coefficient will lead to changes in values displayed by the meter. Therefore only change the temperature coefficient, if you are fully aware of its consequences. If the temperature coefficient setting is wrong it will lead to false display values and at the end to hazards for the patient.

The HDM97*Pocket* enables the user easy to choose between vendor specific temperature coefficients as well as a free adjustable value called "USER TC". To achieve this press the F key while in Conductivity / Temperature measuring mode. Use the ▲ and ▼ navigation key to select between the machine manufacturers. By pressing the navigation key OK the setting will be applied. Pressing the ESC navigation key discards the setting and the meter returns back to measuring mode.

Adjustment of customer specific temperature coefficient "USER TC"

Pressing the navigation key OK while adjusting the temperature coefficient to "USER TC" the HDM97*Pocket* enters a second dialog to adjust the value itself instead of directly going back to measuring mode.

▼ → **USER TC**

OK → enters the dialog to adjust the user temperature coefficient

ESC → cancel and discard setting

Display: **USER TC**

2.070 (Example old value)

2.071 (Example new value, navigation key ▲ has been pressed once)

Keys: ▲ → increments current value

▼ → decrements current value

OK	→	Applies the value to USER TC and chooses USER TC as new temperature coefficient
ESC	→	Discard adjustment and goes on using the last active temperature coefficient setting

Temperature measurement

This mode is only available if enabled in the basic settings menu. This mode exists to save power in case conductivity measurement is not needed.

By pressing the key you can switch between unit °C and °F.

Pressure measurement

In this mode the instrument displays the pressure in the middle line.

Unit

By pressing the key you can choose between units mmHg, mbar and kPa. The values will be recalculated automatically. It is not necessary to tare or adjust the meter if the unit is changed.

Offset balancing (tare)

Caused by drift of the pressure probe, the pressure display may sway slightly around zero. The HDM97***Pocket*** is equipped with a tare function which sets the value to zero if drift occurs. While performing this function there must not be any pressure on the pressure transducers inlet. This is assured when the pressure tube is not connected. Then the environmental pressure represents zero.

Procedure

1. Make sure there is no pressure applied to the pressure transducer
2. Press and hold down the key until the upper display line shows "ZERO", this will take three seconds
3. The measuring value is not set to zero.

Pressure drop measurement

In pressure measuring mode the drop measurement function can be invoked by pressing the F key.

Display:	**PRES 60**		(60 means: 60 seconds countdown)
	406.2		(start value example)
Keys:	OK	→	Stores the current value internally and starts a 60 second countdown. The bottom line displays the difference between the current value and the stored start value
	ESC	→	Cancels the function and return to normal pressure measurement.

After the countdown has finished the instrument beeps 5 time and displays the following values:

Display:	**PRES 00**		
	400.0		(example value after 60 second countdown)
	- 6.2		(example internally stored start value - end value after 60 seconds)
Key:	OK	→	Returns back to normal pressure measurement.

pH measurement

The HDM97***Pocket*** can perform pH measurement in four different ways of temperature compensation.

By pressing the key you can choose between these four compensation modes.

- pH at 20°C — Display "PH 20.0 °C"
- pH at 25°C — Display "PH 25.0 °C"
- pH at 37°C — Display "PH 37.0 °C"
- pH compensated by simultaneous measured temperature — Display "PH"

Fundamental information about pH measurement

For measuring pH, a combined electrode is used. Combination pH electrodes are combinations of one reference electrode and one measuring electrode in a glass tube. The pH value in the dialysate is measured by an unbreakable pH-electrode. The glass body is protected with a plastic coat and due to the jelly-electrolyte-filling, it is maintenance-free. This electrode's diaphragm must be stored in 3 mol/l KCl-solution. The protective cap must be refilled every three to four weeks to prevent the electrode from drying out. Before use the electrode must be checked for exterior damage and crushed glass. Crusts caused by leaking electrolyte can be removed easily by rinsing with reverse osmosis-treated water.
The sample volume should be 100 ml of dialysate or 1 liter of untreated water. The sample should be poured into a clean glass container with a tube or hose, coming into as little contact with air as possible. The pH-value must be measured immediately in the same container. Make sure that the display stabilizes before the value is read. In stirred solutions the response rate is faster; the value, however, must be measured at resting fluid.

The pH-electrode must be dabbed only with a lint-free cloth and never rubbed dry. Rubbing destroys the jelly layer on the glass surface which results in a longer response time for the electrode.

Pressure and fluid currents have considerable influence on the pH measurements. For high accuracy pH measurement it is essential to take the pH measurement in a resting solution at environmental pressure.

Adjustment and Calibration

Precautions

Use the adjustment functions only if you are fully aware of their consequences. Wrong adjustment values will lead to false measurement values and in consequence these false values lead to hazards for patients.

Definitions

Adjustment

An adjustment is a process in which properties of a measuring device are change in that way that its scale or display reads the same as an reference device or standard.

Calibration

Calibration is the process of establishing the relationship between a measuring device and the units of measure. This is done by comparing a device or the output of an instrument to a standard having known measurement characteristics. For example the length of a stick can be calibrated by comparing it to a standard that has a known length. Once the relationship of the stick to the standard is known the stick can be used to measure the length of other things. Adjustments are checked by performing a calibration.

General

According to ISO 10012-1 “General Quality Assurance Requirements for Measuring Equipment" the error attributable to calibration should be as small as possible. In most areas of measurement, it should be not more than one third and preferably one tenth of the permissible error of the confirmed equipment when in use. In other words the accuracy of the references to adjust or calibrate the HDM must have at least a tree times higher accuracy.

After a channel has been adjusted it is necessary to calibrate it afterwards. If inconclusive or incomprehensible values are shown in the display it is highly recommended to do a calibration.

The procedure of calibration and adjustment is slightly different for each channel. Proceed with an adjustment only if you have fully understood the procedure.

- Conductivity is adjusted only at one sampling point. No further points are needed due to the high linearity of the conductivity probe.
- The temperature sensor does not drift. Normally there is no adjustment necessary. The adjustment is done by using two sampling points.
- The pressure transducers drift is linear within its tolerances, so there is a tare function (see chapter "Measuring"). Normally there is no adjustment necessary. The adjustment is done by using seven sampling points.
- Due to the kind of their technology it is necessary to adjust pH probes periodically. This is done using two sampling points.

If you are uncertain of entering the correct adjustment values you can discard the values and cancel the adjustment procedure at any time.

Handling of Reference Solutions

IBP Medical standard solutions are produced under ISO13485:2003 quality management. They are traceable to NIST and PTB Standards Reference Materials and are sealed with tamper-evident packaging.

To ensure standard solution and calibration/verification accuracy

- Keep solutions tightly capped to avoid evaporation
- Do not return used solutions to the storage bottle
- Do not remove solutions from their original bottle
- Keep the solutions in a cool place
- Use only fresh reference solutions for calibration and verification
- Use the solution immediately after pouring, evaporation will cause errors
- Discard solution the appropriate number of days after opening the bottle
- Discard solution after the expiration date

Adjusting the HDM97*Pocket*

Use these functions only if you are fully aware of their consequences. Wrong adjustment values will lead to false measurement values and in consequence these false values may lead to hazards for patients.

The entire procedure is guided by using software, it is not necessary to open the instrument. To invoke the adjustment menu first select the channel you want to adjust. Then press and hold down the keys ▼ und ☰ at the same time for at least 5 seconds. If you want to cancel the operation press navigation key ESC.

Temperature

Temperature adjustment is done using 2 sampling points. The order of the adjustment points is preassigned and the value range of each point is restricted by boundaries.

Point	Display	Temperature	Boundaries
1.	"TP1"	25.000 °C	±1.500 °C
2.	"TP2"	55.000 °C	±1.500 °C

Normally an adjustment is not necessary because the sensor has no drift.

The temperature sensor must be dipped into a liquid with known temperature. This known temperature must be adjusted using the navigation keys ▲ and ▼. It is mandatory to wait until the measuring value becomes stable. After the measuring value finally becomes stable the adjustment point can be applied using the navigation key OK. The instrument jumps immediately to the next adjustment point, so the procedure can be repeated. After the last adjustment point has been applied the instrument displays "CAL OK" in the upper line of its display. If the adjustment is not correct, the instrument displays "CAL ERR" in the display along with a long warning beep. In this case the adjustment values will be discarded and the procedure has to be started from the beginning. A failed adjustment can also be an outcome of a defective instrument.

Pressure

The pressure transducer has no nonlinear drift so an adjustment is normally not necessary.
Use the tare function to balance the pressure transducers environmental pressure change drift.

The pressure channel is adjusted using 7 sampling points. This improves the accuracy of the pressure measurement, because it recalculates slightly nonlinearities of the pressure transducer. The order of the adjustment points starts with point 1 and is preassigned. The value range of each point is restricted by boundaries.

Apply the pressure values to the instruments pressure transducer inlet as shown in the table below. Adjust the value of your reference or standard to the HDM using the navigation keys ▲ and ▼. It is mandatory to wait until the measuring value becomes stable. After the measuring value finally becomes stable the adjustment point can be applied using the navigation key OK. The instrument jumps immediately to the next adjustment point, so the procedure can be repeated. After the last adjustment point has been applied the instrument displays "CAL OK" in the upper line of its display. If the adjustment is not correct, the instrument displays "CAL ERR" in the display along with a long warning beep. In this case the adjustment values will be discarded and the procedure has to be started from the beginning. A failed adjustment can also be an outcome of a defective instrument.

Point	Display	Pressure	Boundaries
1.	"PR1"	-500 mmHg	±10 mmHg
2.	"PR2"	-250 mmHg	±10 mmHg
3.	"PR3"	0 mmHg	±10 mmHg
4.	"PR4"	150 mmHg	±10 mmHg
5.	"PR5"	300 mmHg	±10 mmHg
6.	"PR6"	900 mmHg	±10 mmHg
7.	"PR7"	1500 mmHg	±10 mmHg

Conductivity

The adjustment of the conductivity channel is done by adjusting the cell parameter. To achieve this only one adjustment point is necessary.

Point	Display	Cell parameter	Initial Conductivity
1.	"CD xx.xx°"	0.xxxx	14.000 mS/cm

First of all set the displayed adjustment value to the value of your reference solution. Then make sure that the solution has a stable temperature of exactly 25.00 °C. Wait until both the temperature and the conductivity values in the display become stable before pressing the navigation key OK. After that the cell parameter is being calculated and will be stored in the instrument.

pH

It is necessary to adjust th pH channel before each usage. It is achieved using two adjustment points.

Point	Display	Initial pH value
1.	"PH1"	6.00
2.	"PH2"	8.00

A pH adjustment has to be done according to the following instructions:
Set the mode of temperature compensation to the mode you have to use afterwards. Prepare 2 buffer solutions which should not be more different than 2 pH values from each other and which are around the value you expect from your measurement. If you expect to measure values around pH 6 then use the pH 5 and pH 7 buffer solutions for instance. The adjustment has to begin with the lower pH value and to end with the higher pH value. Preset the buffer solutions value using the ▲ and ▼ navigation keys.
Before dipping the probe into the buffer solution it has to be flushed with distilled water and dried by carefully dabbing it. Depending on the mode you have chosen the temperature sensor must also be flushed and dried. Then dip both into the buffer solution and wait until the measuring values become stable. In this case apply the value using the navigation key OK. Flush and dry the probes before continuing with the second adjustment point. The second point is adjusted in the same way. After the last adjustment point has been completed the instrument displays "CAL OK" in the upper line of its display. If the adjustment is not correct, the instrument displays "CAL ERR" in the display along with a long warning beep. In this case the adjustment values will be discarded and the procedure has to be started from the beginning. A failed adjustment can also be an outcome of a defective instrument.

Cancelling the adjustment procedure

If you are uncertain to have entered the correct values at any step in the adjustment procedure you can cancel the process at any time. Cancelling the operation will discard the adjustment values.

Restoring adjustment values with factory adjustment values

If you have failed to adjust the instrument properly, you can overwrite the user adjustments with a factory adjustment value set which has been stored into the instrument during production process. Please refer to chapter "Basic settings".

Maintenance of HDM97*Pocket*

Generally the HDM97***Pocket*** can be considered as an easy-care instrument. Like all measuring instruments there is a minimum of maintenance and care necessary to ensure that all functions work flawlessly.

Operate the instrument only in a dry environment, and do not touch it with damp hands. Ensure that no fluids intrude into the interior of the device, or into the sockets at the front.

There are no parts in the HDM97***Pocket*** which you can repair yourself. Contact our technical support team in the event of any malfunction. If the device should become damaged, or malfunction, send it to IBP or your distributor for repair.

Storage

Keep the device in a dry place. Suitable is, for example, the original packaging in which you have received the HDM97***Pocket*** , or the carrying case offered by IBP as accessory. If you do not use the device over a longer period of time, you should connect it to the included charging device about every month for one hour to avoid exhausting the batteries.

Cleaning

Never clean the device with any fluids! In case of pollution you can wipe the surface of the HDM97***Pocket*** with a dry and clean cloth. For measurements in the lower conductivity range, the cleaning of the conductivity/temperature measuring cell is recommended. Remove water-soluble substances by rinsing with deionized water, fats and oils with warm water and household dish washing detergent. Lime and hydroxid crusts can be dissolved by a 10% citric acid solution. In each case, the measuring cell needs to be washed with deionized water after the cleaning. Basically, the conductivity measuring cell does not decay over time. Particular measuring media (for example, strong acids and caustic solutions, organic solvents), or too high temperatures shorten the service life considerably, and/or lead to damage.

Caring for the conductivity/temperature electrode

Thorough cleaning of the electrode is particularly important for measuring low conductivities.
Water-soluble substances must be removed by rinsing with deionized water. Remove lime deposits with a 10% citric acid solution. To do this, immerse the electrode in the solution for 2 hours at room temperature, then rinse it thoroughly with deionized water. Do not touch the electrode surface with your fingers. If necessary, clean the surface with acetone.

Calibration period

When delivered new from the factory, each device is adjusted and calibrated before shipment. To ensure reliability, we recommend the following intervals for verifying calibration:

Parameter	Calibration period
Temperature	Once per year
Conductivity	Once per year
Pressure	Once per year
pH	Daily before each use

A complete function test and calibration of the device should be done once a year.

According to ISO 10012-1 “General Quality Assurance Requirements for Measuring Equipment" the error attributable to calibration should be as small as possible. In most areas of measurement, it should be not more than one third and preferably one tenth of the permissible error of the confirmed equipment when in use. In other words the accuracy of the references to adjust or calibrate the HDM must have at least a tree times higher accuracy.

For liability reasons you should not carry out these tests and calibration and verification yourself. If IBP performs the calibration, you will receive a calibration certificate in accordance to ISO9001 which documents the calibration/verification results.

Tolerances

For calibration, the instrument must met the deviations listed below.

Channel	Reference Value	Allowed deviation	Notes
Temperature	25,00 ^{O}C	± 0,05 ^{O}C	
	34,00 ^{O}C	± 0,05 ^{O}C	
	37,00 ^{O}C	± 0,05 ^{O}C	
	40,00 ^{O}C	± 0,05 ^{O}C	
	55,00 ^{O}C	± 0,07 ^{O}C	
	80,00 ^{O}C	± 0,07 ^{O}C	
Conductivity	74,00 µS/cm	± 0,60 µS/cm	
	147 µS/cm	± 0,60 µS/cm	
	720 µS/cm	± 6,00 µS/cm	
	1410 µS/cm	± 6,00 µS/cm	
	2,77 mS/cm	± 0,03 mS/cm	
	6,70 mS/cm	± 0,03 mS/cm	
	12,88 mS/cm	± 0,03 mS/cm	
	16,00 mS/cm	± 0,03 mS/cm	
Pressure	+ 190,00 kPa	± 0,13 kPa	
	+ 110,00 kPa	± 0,13 kPa	
	+ 50,00 kPa	± 0,13 kPa	
	+ 40,00 kPa	± 0,066 kPa	
	+ 25,00 kPa	± 0,066 kPa	
	+ 10,00 kPa	± 0,066 kPa	
	0,00 kPa	± 0,066 kPa	Open inlet
	- 10,00 kPa	± 0,13 kPa	
	- 50,00 kPa	± 0,13 kPa	
	- 80,00 kPa	± 0,13 kPa	
pH	355,2 mV = pH 1	± 0,02	Δ*E*=-59,2mV/ΔpH
	177,6 mV = pH 4	± 0,02	Δ*E*=-59,2mV/ΔpH
	118,4 mV = pH 5	± 0,02	Δ*E*=-59,2mV/ΔpH
	59,2 mV = pH 6	± 0,02	Δ*E*=-59,2mV/ΔpH
	0 mV = pH 7	± 0,02	Δ*E*=-59,2mV/ΔpH
	- 59,2 mV = pH 8	± 0,02	Δ*E*=-59,2mV/ΔpH
	-118,4 mV = pH 9	± 0,02	Δ*E*=-59,2mV/ΔpH
	-177,6 mV = pH 10	± 0,02	Δ*E*=-59,2mV/ΔpH
	-355,2 mV = pH 14	± 0,02	Δ*E*=-59,2mV/ΔpH

Troubleshooting

Problem:
USB cable connected, but the battery is not being charged

Reason: USB port of laptop does not provide enough power
Solution: Connect the meter to the battery charger or a USB port which is able to supply at least 500 mA.

Reason: USB cable broken
Solution: Replace cable

Problem:
The meter can not be switched on

Reason: Battery is empty.
Solution: Connect the meter to a battery charger or an USB port.

Reason: Other problems.
Solution: Press and hold the on/off key for at least 5 seconds. The meter will perform a "Low-Level-Reset" and should start afterwards.

Problem:
The meter powers off itself after a couple of seconds.

Reason: Battery empty.
Solution: Connect the meter to a battery charger or an USB port.

Problem:
pH channel can not be selected (only Version *BP*)

Reason: pH channel is disabled in basic settings menu.
Solution: enable pH channel in basic settings menu.

Problem:
Pressure value does not tare / zero balancing does not work (only versions *BO* and *BP*)

Reason: There is still pressure applied to the pressure transducer.
Solution: Disconnect pressure hose directly at meter.

Technical data

Conductivity

0 to 30,0 mS/cm, 4-Pole probe,
Resolution and accuracy:

Range	Resolution	Accuracy
0.0 – 200 µS/cm	0,1 µS/cm	± 0,6 µS/cm
201 - 1999 µS/cm	1 µS/cm	± 6µS/cm
2,00 – 30 mS/cm	0,01 mS/cm	± 0,03 mS/cm

Reference temperature 25° C

Temperature compensation is 2,070 % per Kelvin
Adjustable from 0.00 to 4,00 %/Kelvin
Or selectable from dialysis machine manufacturer preset values.

Temperature

Range	0 … 100 °C,
Resolution	0,01 °C
Accuracy	25 … 40°C ± 0,05°C otherwise ± 0,1°C

Pressure

Range	-700 … 1900 mmHg, 2.5 Bar
Resolution	1 mmHg
Accuracy	± 2 mmHg (20 … 23 °C)

pH

Range	pH 0 … 14 ; max. slew rate 70mV (118%) / ΔpH
Resolution	pH 0,01
Accuracy	pH ± 0,02
DC input impedance	min. 10 Tera Ohm (min. 10 * 10^{12} Ohm)
Input leackage current	typ. ± 2 fA ; max. ± 2 pA

Temperature compensation with temperature measurement or preset values to choose from.

Internal power source

Internal Li-Ion-Polymer battery, rechargeable with USB 5V DC / max. 500mA
Operating time, depending in channel, up to 60 hours.

Nominal Voltage	3,7 V
Max. charge voltage	4,2 V (internally generated an monitored)
Capacity	850 mAh or 3,1 Wh
Battery charge time	approx. 3 hours

External power supply

Input voltage	100-240 V AC/ 50-60Hz
Output voltage	5 V DC, 1000 mA LPS
Plug	Mini USB A-Plug

Degree of protection

Meter	IPX1
Conductivity probe	IP66 , max. 0,5 m immersion depth, max. 5 min

Size and weight

Size	165 x 82 x 33 mm
Weight	400 gr. without battery charger, including conductivity/temperature probe

These technical data may be changed without notice!

PC Interface

USB Interface

The USB interface of the HDM97*Pocket* is electrically isolated from the appliance part. Two drivers are needed for installation. One driver is made for invoking the interface like any other USB device and the other driver is used to emulate a serial COM port device.

Interface parameters for serial COM port emulation

The HDM97*Pocket* uses the preset values below for serial COM port emulation:

Property	**Value**
Baud rate	9600 bps
Data bits	8
Parity	None
Stop Bit	1
Handshake	none

Driver installation, example for *Microsoft® Windows® XP Service Pack 2*

1. Insert the Installation-CD in the CD or DVD drive of your computer.

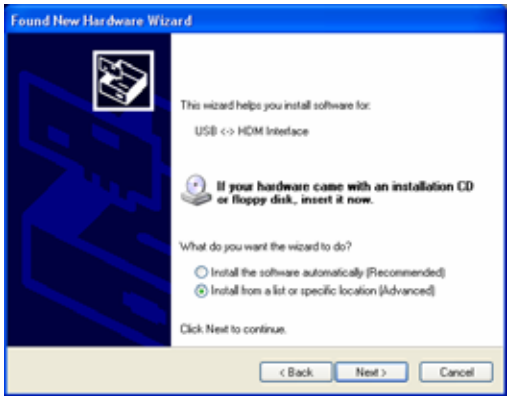
2. Connect the HDM97***Pocket*** via the USB-cable with a free USB port of the running computer. It does not matter whether the instrument is switched on or off.

3. A "Found New Hardware Wizard" Window will appear on the screen like that right here from the text.

4. Choose "No, not this time" and afterward click on the button "Next".

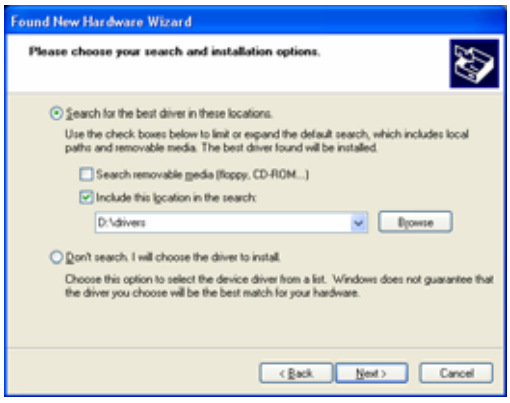
Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

5. Driver source selection dialog: Choose "Install from a list or specific location (Advanced)", and click on the "Next" button afterwards

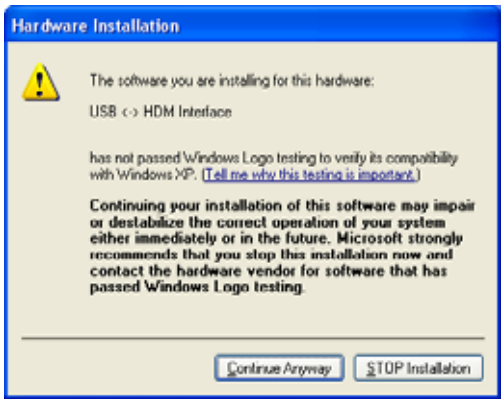

Found New Hardware Wizard
This wizard helps you install software for:
USB <-> HDM Interface
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

6. Choose "Search fort he best driver in these locations" and check "Include this location in the search:". Then use the "Browse" button and choose your CD/DVD drive's letter and add the folder "drivers" to it. In the given example on the right side the CD/DVD driver has drive letter D:\" assigned.

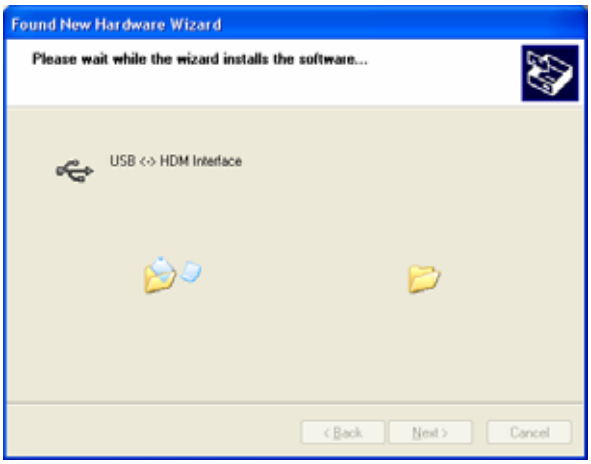
   Click on the "Next" button afterwards.


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
D:\drivers
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

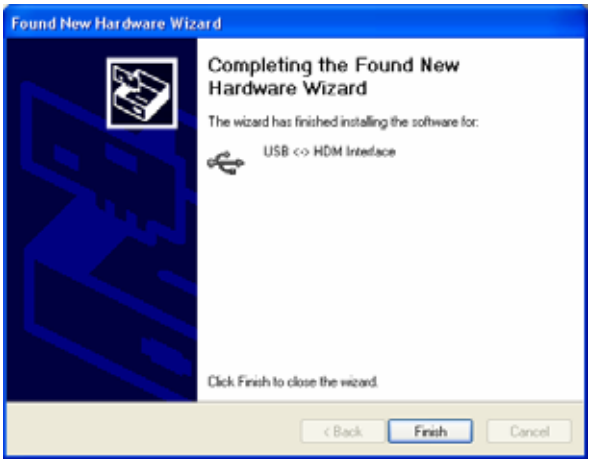
7. Windows Logo Test : Choose "Continue Anyway".


Hardware Installation
The software you are installing for this hardware:
USB <-> HDM Interface
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

8. The driver installation is in progress. This can take a couple of minutes.



9. The driver installation was successful, click on the button "Finish" to complete the procedure.

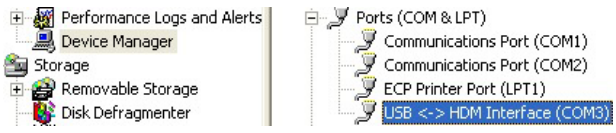


After you have finished this procedure another similar Wizard will popup. Do exactly the same you did in the first procedure as described earlier. One installation is for the COM port emulation, the other installation is for the USB interface itself.

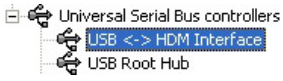
Checking the driver installation (optional)

The USB interface of the HDM97***Pocket*** emulates a serial COM port and offers a proprietary interface to communicate directly with the USB interface.

Use the "My Computer/Manage" function to open the Device Manager and search for a Group called "Ports (COM and LPT)". You should find an entry called "USB <-> HDM Interface". At the end of the line you will find the number of the associated COM port (in this case "COM3").



In addition you will find the USB communication interface in the Group "USB-Controller" It is named " USB <-> HDM Interface ".



Data transfer

To receive measurements from the HDM97*Pocket* via the USB interface, the following abbreviations must be sent via the interface. The entire communication takes place in readable ASCII-characters.

Command to HDM97*Pocket*	**Reaction of the** HDM97*Pocket*
HDMCMO	activates the data transfer
HDMCMF	deactivates the data transfer
HDMEIH	transmits all units
hdm	transmits the values

Format of the values

Conductivity in S/cm	9 signs
Temperatur in °C	7 signs
Druck in mmHg	9 signs
pH	5 signs
CR, LF	2 signs

Die Trennung der einzelnen Werte erfolgt durch /

Example

Command „hdm“ – HDM sendet: 0.1234567/123.123/ -12345.12/12.12 + CR LF

Command „HDMEIH“ – HDM sends: S/cm,°C,mmHg,pH CR LF

IBPView

What is IBPView

IBPView can be obtained optionally for the HDM97***Pocket*** and can be used as well for other HDM instruments. A demo version is included in the folder \Software\ on the driver CD. This demo can not save, export or print and the acquisition time is limited to 30 seconds.

IBPView is a data acquisition software, which records and plots measured values from a HDM97***Pocket*** device. It works with a USB connection of the HDM97***Pocket***. The software can also be used with several hardware devices, such multimeters from *Voltcraft* or *Metex*.

IBPView is compatible with *Microsoft® Windows® 2000, Microsoft® Windows® XP* and *Microsoft® Windows® Vista®*

Several curves can be plotted into a single diagram. Several diagrams can be arranged on one or more pages if necessary.

Plot options like pen width or pen color can be used to create perfectly styled diagrams. You can even create your own plotter designs.

Comfortable zoom functions are available on a single click to analyse plot details or to return to the plots overview.

Setting markers makes it easy to read differential values of a plot, or to determine the amplitude or period of a sampled signal.

A comfortable preview allows you to add comments or project data when printing diagrams.

Export functions can be used to use measured data with other applications like MS-Excel, etc.

The help function of **IBPView** includes instructions for basic operations using a small project as an example. If you follow these instructions it will be a good start for you in understanding the basics.

Installation

Insert the CD „IBPView“ into the CD-Drive. The installatio will start automatically. In case open the directory „SETUP“ and start setup.exe. On then first menu select the language, the installation process is self explaining.

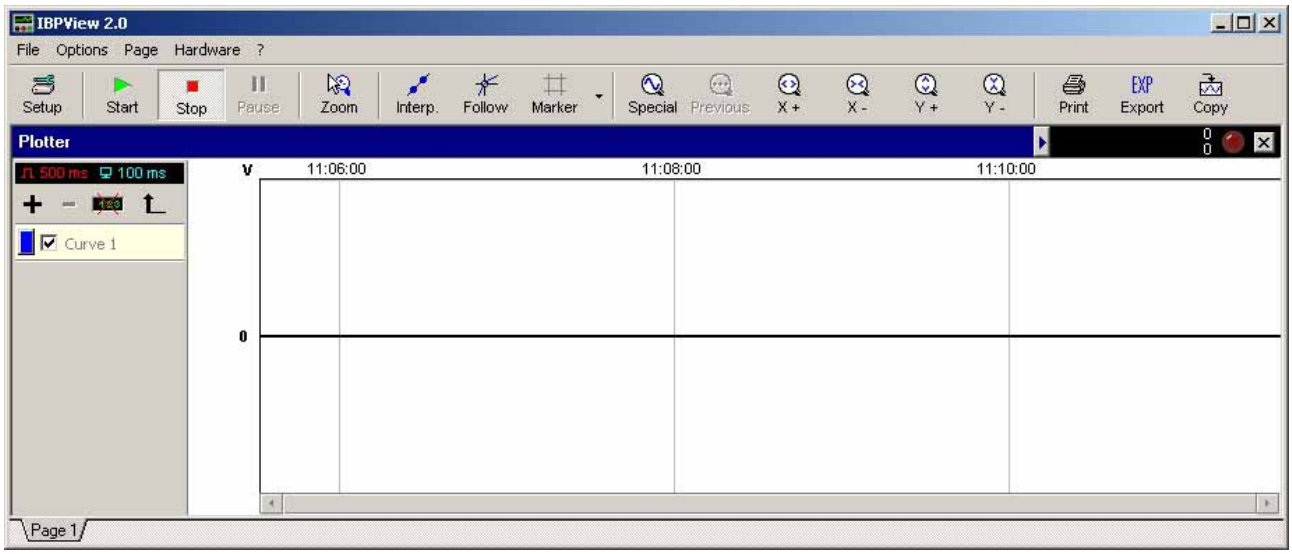
Quickstart

On the CD „**HDM97*Pocket***“ you will find templates for all versions of the HDM97*Pocket* . These templates are prepared fort wo, three and four measuring channels. Do not use a template which is prepared for more measuring channels than measuring channels meter has.

Disconnect USB

Before terminating the USB connection please terminate the IBPView software. Disconnecting with running data acquisition may end in a system freeze.

Main Window



General

This manual describes only the basic functions which are necessary to get familiar with **IBPView**. Further information can be obtained using the Software's help function. **IBPView** is intentionally not limited to HDM instruments. It can be configured independently and therefore achieves its maximum flexibility to be ready for future IBP products.

Hardware Interface

IBPView uses serial COM ports for communication. This can be common RS232 serial interfaces like many multimeters on the market use, or, like the HDM97***Pocket*** virtual serial ports based on USB. Using virtual COM ports it is necessary to define the number of the port once (COM1, COM2, COM3, etc.). The COM port number of the hardware is defined automatically during the driver installation. The application must know this number, in order to communicate with the device. For obtaining the number for the HDM97Pocket please refer to chapter "Checking the driver installation". In this example "COM3" is used. Be aware that connecting the HDM97***Pocket*** to different physical USB receptacles will result in different COM port numbers, one for each receptacle. This is done to make multiple HDM meters work with one computer concurrently.

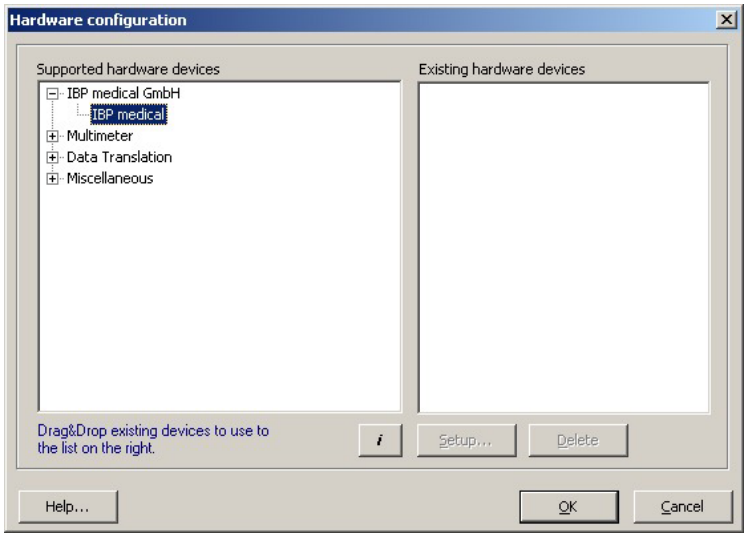
Template projects

Project files are named in the way "*[Name].ibp*". To get an easy start with **IBPView** there are preconfigured version specific templates for each type of instrument. These templates include all common setting for start working with the application. Only the number of the COM port must be adjusted to the number the driver installation has chosen if it is not coincidentally the same number is used. For help to select the right COM port read also chapter "**Checking the driver installation".**

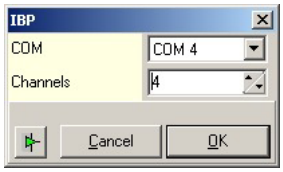
Templates are available on the CD "HDM97***Pocket***".

Selecting hardware

1. Click on "*Hardware*" in the main window and choose menu entry "*Define…*". Then a window named "*Hardware configuration*" like that right from this text will open. Open in the left box "*Supported hardware devices*" the group "*IBP Medical GmbH*", click on the entry "*IBP Medical Devices*" and then drag and drop it to the right box "*Existing hardware devices*".

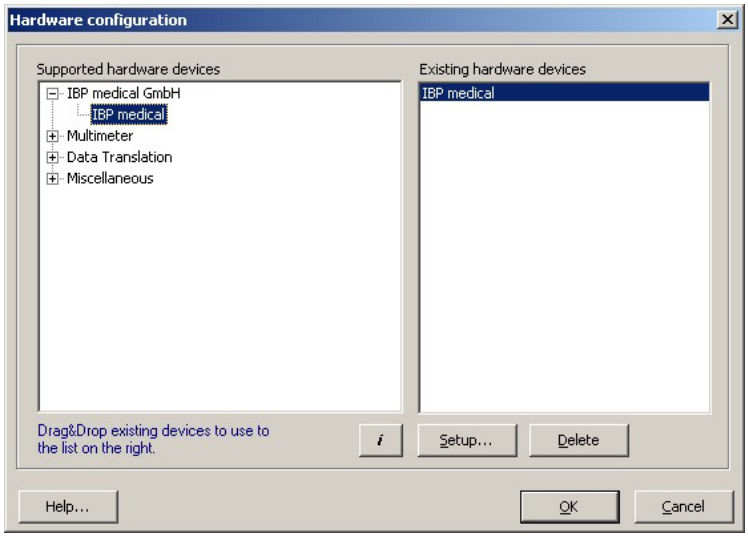


2. After the drag and drop procedure a window opens which can be used to set the number of the serial COM port and the number of channels for the instrument. For a HDM97*BP* four channels are possible. In case the pH channel is disabled in the base settings of the *HDM97BP*, the meter has only three measuring channels. Selecting of a wrong channel number than the meter really provides will result in a not working data transmission.

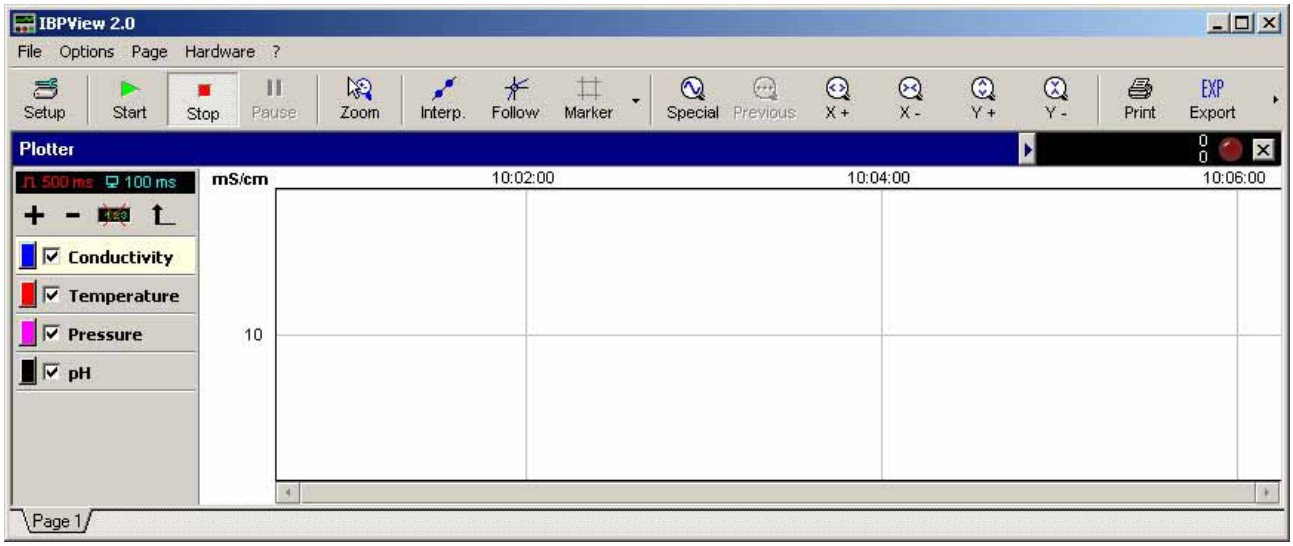


To find out which COM-Port the USB-Driver has selected please select the Windows System Manager and than the Device Manager. Under group "Conncetions (COM and LPT)" you should find the port.

3. After this the device is displayed in the right box. Other hardware devices can be added if needed. Click on "OK" to close the window.



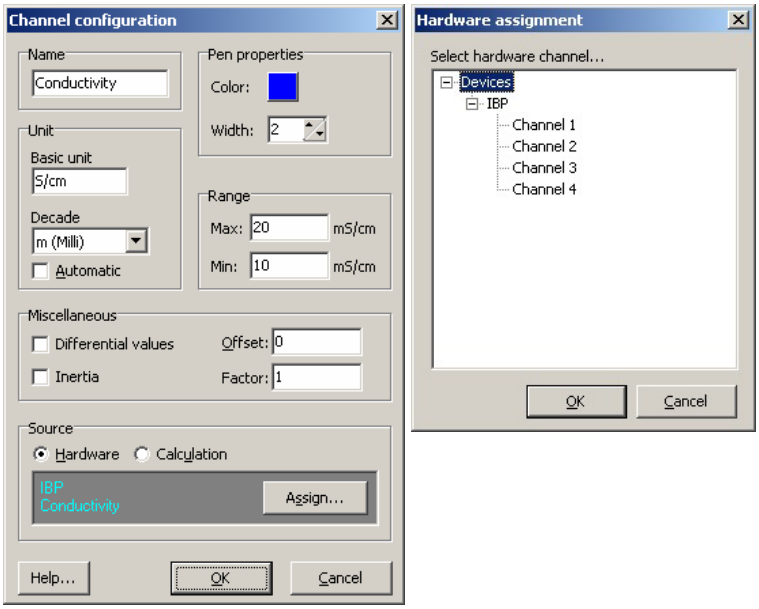
Assigning graphs to hardware channels



In the main window the list of channels is located left. The assignment of a particular graph to a specific hardware channel is done by performing a double click on the channel's name in the list.

This double click leads to a dialog "*Cannel configuration*" (picture in the middle). You can change Name, Basic units, Decades, Ranges and much more. By clicking on the button "Assign" you can assign each graph a hardware channel, like shown in the picture right.

For conductivity please use the base unit S/cm and select for example “m (milli)” as Decade to show the values in mS/cm.



List of channels

Depending on the version the HDM97***Pocket*** is equipped with up to 4 channels

Channel	Description	Range	Unit	HDM97*BN*	HDM97*BO*	HDM97*BP*
1.	Conductivity	0.000 .. 30.00	mS/cm	✓	✓	✓
2.	Temperature	0,00 .. 100,00	°C	✓	✓	✓
3.	Pressure	-750,0 .. 1900	mmHg		✓	✓
4.	pH	0 .. 14	(ohne)			✓ If not disabled

If the wrong number of channels is selected the data transmission will not work correctly. In case the pH channel is disabled in the base settings of the *HDM97BP*, the meter has only three measuring channels.